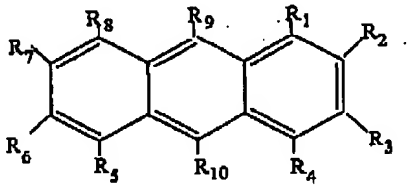
This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

1. (Currently amended) A method for making a hypermutable plant or yeast cell *in vitro* comprising exposing ~~said~~a plant cell or yeast cell to an inhibitor of mismatch repair, thereby rendering said cell hypermutable, wherein said inhibitor is an anthracene, wherein said anthracene has the formula:




wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, amino, alkyl, substituted alkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, O-alkyl, S-alkyl, N-alkyl, O-alkenyl, S-alkenyl, N-alkenyl,O-alkynyl, S-alkynyl, N-alkynyl, aryl, substituted aryl, aryloxy, substituted aryloxy, heteroaryl, substituted heteroaryl, aralkyloxy, arylalkyl, alkylaryl, alkylaryloxy, arylsulfonyl, alkylsulfonyl, alkoxycarbonyl, aryloxycarbonyl, guanidino, carboxy, an alcohol, an amino acid, sulfonate, alkyl sulfonate, CN, $NO_2$, an aldehyde group, an ester, an ether, a crown ether, a ketone, an organosulfur compound, an organometallic group, a carboxylic acid, an organosilicon or a carbohydrate that optionally contains one or more alkylated hydroxyl groups;

wherein said heteroalkyl, heteroaryl, and substituted heteroaryl contain at least one heteroatom that is oxygen, sulfur, a metal atom, phosphorus, silicon or nitrogen; and

wherein said substituents of said substituted alkyl, substituted alkenyl, substituted alkynyl, substituted aryl, and substituted heteroaryl are halogen, CN, $NO_2$, lower alkyl, aryl, heteroaryl, aralkyl, aralkyloxy, guanidino, alkoxycarbonyl, alkoxy, hydroxy, carboxy and amino; and

wherein said amino groups optionally substituted with an acyl group, or 1 to 3 aryl or lower alkyl groups.

2-3. (Canceled)

4. (Previously presented) The method of claim 1 wherein $R_5$ and $R_6$ are hydrogen.

5. (Previously presented) The method of claim 1 wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, alkyl, aryl, arylalkyl, or hydroxyalkyl.

6. (Previously presented) The method of claim 1 wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, phenyl, tolyl, hydroxymethyl, hydroxypropyl, or hydroxybutyl.

7. (Previously presented) The method of claim 1 wherein said anthracene is selected from the group consisting of 1,2-dimethylanthracene, 9,10-dimethyl anthracene, 7,8-dimethylanthracene, 9,10-diphenylanthracene, 9,10-dihydroxymethylanthracene, 9-hydroxymethyl-10-methylanthracene, dimethylanthracene-1,2-diol, 9-hydroxymethyl-10-methylanthracene-1,2-diol, 9-hydroxymethyl-10-methylanthracene-3,4-diol, and 9, 10-di-m-tolyanthracene.

8. (Previously presented) The method of claim 1 wherein $R_3$, $R_4$, $R_5$, $R_6$, $R_7$, $R_8$, $R_9$ and $R_{10}$ are hydrogen.

9. (Previously presented) The method of claim 1 wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_7$ and $R_8$ are hydrogen.

10. (Previously presented) The method of claim 1 wherein $R_3$, $R_4$, $R_5$, $R_6$, $R_7$ and $R_8$ are hydrogen.

11. (Previously presented) The method of claim 1 wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_9$ and $R_{10}$ are hydrogen.

COPY

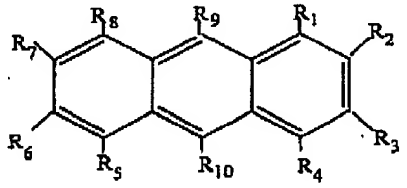
12. (Previously presented) The method of claim 1 wherein $R_1$, $R_2$, $R_5$, $R_6$, $R_7$ and $R_8$ are hydrogen.

13. (Previously presented) The method of claim 1 wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_7$, $R_8$ and $R_{10}$ are hydrogen.

14-21. (Canceled)

22. (Original) The method of claim 1 wherein said inhibitor of mismatch repair is introduced into a growth medium of a plant.

23. (Currently amended) A method for generating a mutation in a gene of interest comprising exposing a plant cell or yeast cell comprising said gene of interest to a chemical mismatch repair inhibitor *in vitro* to generate a hypermutable cell, wherein said mismatch repair inhibitor is an anthracene having the formula:




wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, amino, alkyl, substituted alkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, O-alkyl, S-alkyl, N-alkyl, O-alkenyl, S-alkenyl, N-alkenyl,O-alkynyl, S-alkynyl, N-alkynyl, aryl, substituted aryl, aryloxy, substituted aryloxy, heteroaryl, substituted heteroaryl, aralkyloxy, arylalkyl, alkylaryl, alkylaryloxy, arylsulfonyl, alkylsulfonyl, alkoxycarbonyl, aryloxycarbonyl, guanidino, carboxy, an alcohol, an amino acid, sulfonate, alkyl sulfonate, CN, $NO_2$, an aldehyde group, an ester, an ether, a crown ether, a ketone, an organosulfur compound, an organometallic group, a carboxylic acid, an organosilicon or a carbohydrate that optionally contains one or more alkylated hydroxyl groups;

wherein said heteroalkyl, heteroaryl, and substituted heteroaryl contain at least one heteroatom that is oxygen, sulfur, a metal atom, phosphorus, silicon or nitrogen; and

wherein said substituents of said substituted alkyl, substituted alkenyl, substituted alkynyl, substituted aryl, and substituted heteroaryl are halogen, CN, $NO_2$, lower alkyl, aryl, heteroaryl, aralkyl, aralkyloxy, guanidino, alkoxycarbonyl, alkoxy, hydroxy, carboxy and amino;

and wherein said amino groups optionally substituted with an acyl group, or 1 to 3 aryl or lower alkyl groups;

testing said hypermutable cell to determine whether said gene of interest comprises a mutation; and

removing the chemical inhibitor of mismatch repair.

24. (Original) The method of claim 23 wherein said testing comprises analyzing a polynucleotide sequence of said gene of interest.

25. (Canceled)

26. (Currently amended) The method of claim 23 wherein said testing comprises analyzing the phenotype of said plant cell or yeast cell.

27-67. (Canceled)

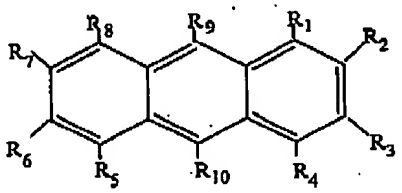
68. (Original) The method of claim 23 further comprising exposing said cell to a mutagen.

69. (Canceled)

70. (Previously presented) The method of claim 68 wherein said mutagen is selected from the group consisting of N-methyl-N'-nitro-N-nitrosoguanidine, methane sulfonate, dimethyl sulfonate, O-6-methyl benzadine, ethyl methanesulfonate, methylnitrosourea, and ethylnitrosourea.

71. (Canceled)

72. (Currently amended) A method for making a hypermutable plant comprising exposing at least one cell of said plant to an inhibitor of mismatch repair, thereby rendering said cell hypermutable, wherein said inhibitor is an anthracene, wherein said anthracene has the formula:




wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, amino, alkyl, substituted alkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, O-alkyl, S-alkyl, N-alkyl, O-alkenyl, S-alkenyl, N-alkenyl,O-alkynyl, S-alkynyl, N-alkynyl, aryl, substituted aryl, aryloxy, substituted aryloxy, heteroaryl, substituted heteroaryl, aralkyloxy, arylalkyl, alkylaryl, alkylaryloxy, arylsulfonyl, alkylsulfonyl, alkoxycarbonyl, aryloxycarbonyl, guanidino, carboxy, an alcohol, an amino acid, sulfonate, alkyl sulfonate, CN, $NO_2$, an aldehyde group, an ester, an ether, a crown ether, a ketone, an organosulfur compound, an organometallic group, a carboxylic acid, an organosilicon or a carbohydrate that optionally contains one or more alkylated hydroxyl groups;

wherein said heteroalkyl, heteroaryl, and substituted heteroaryl contain at least one heteroatom that is oxygen, sulfur, a metal atom, phosphorus, silicon or nitrogen; and

wherein said substituents of said substituted alkyl, substituted alkenyl, substituted alkynyl, substituted aryl, and substituted heteroaryl are halogen, CN, $NO_2$, lower alkyl, aryl, heteroaryl, aralkyl, aralkyloxy, guanidino, alkoxycarbonyl, alkoxy, hydroxy, carboxy and amino; and

wherein said amino groups optionally substituted with an acyl group, or 1 to 3 aryl or lower alkyl groups.

73. (Previously presented) The method of claim 72 wherein $R_5$ and $R_6$ are hydrogen.

74. (Previously presented) The method of claim 72 wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, alkyl, aryl, arylalkyl, or hydroxyalkyl.

75. (Previously presented) The method of claim 72 wherein $R_1$-$R_{10}$ are independently hydrogen, hydroxyl, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, phenyl, tolyl, hydroxymethyl, hydroxypropyl, or hydroxybutyl.

76. (Previously presented) The method of claim 72 wherein said anthracene is selected from the group consisting of 1,2-dimethylanthracene, 9,10-dimethyl anthracene, 7,8-dimethylanthracene, 9,10-diphenylanthracene, 9,10-dihydroxymethylanthracene, 9-hydroxymethyl-10-methylanthracene, dimethylanthracene-1,2-diol, 9-hydroxymethyl-10-methylanthracene-1,2-diol, 9-hydroxymethyl-10-methylanthracene-3,4-diol, and 9, 10-di-m-tolyanthracene.

77. (Previously presented) The method of claim 72 wherein $R_3$, $R_4$, $R_5$, $R_6$, $R_7$, $R_8$, $R_9$ and $R_{10}$ are hydrogen.

78. (Previously presented) The method of claim 72 wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_7$ and $R_8$ are hydrogen.

79. (Previously presented) The method of claim 72 wherein $R_3$, $R_4$, $R_5$, $R_6$, $R_7$ and $R_8$ are hydrogen.

80. (Previously presented) The method of claim 72 wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_9$ and $R_{10}$ are hydrogen.

81. (Previously presented) The method of claim 72 wherein $R_1$, $R_2$, $R_5$, $R_6$, $R_7$ and $R_8$ are hydrogen.

82. (Previously presented) The method of claim 72 wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_7$, $R_8$ and $R_{10}$ are hydrogen.

83. (Canceled)

84. (Previously presented) The method of claim 72 wherein said testing comprises analyzing a polynucleotide sequence of said gene of interest.